TOUGH Symposium 2003

Lawrence Berkeley National Laboratory

Berkeley, California

May 12–14, 2003

Technical Program

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Monday Morning, May 12, 2003, Building 66 Auditorium

07:30 – 08:30 Registration

08:30 – 08:45 Karsten Pruess   Welcome

08:45 – 09:00 Organizing Committee   Introduction and Announcements

Monday Morning, May 12, 2003, Building 66 Auditorium

Session 1:   Geothermal Reservoir Engineering

Chairman: Marcelo Lippmann, Lawrence Berkeley National Laboratory, Berkeley, California

09:00 − 09:30   *Grimur Björnsson*, Arnar Hjartarson, *Development of a 3-D geothermal reservoir model for the greater Hengill*
                Gudmundur Bodvarsson,   *volcano in SW-Iceland*
                Benedikt Steingrimsson

09:30 − 09:50   Cornel Ofwona   An update of the natural state numerical model of Olkaria geothermal system,
                                            Kenya

09:50 − 10:10   Claudio Calore, Alfredo Battistelli   Application of TOUGH2/EWASG to the modelling of salt water injection into
                                            a depleted geothermal reservoir: preliminary results

10:10 − 10:40   *Coffee Break*

10:40 − 11:00   Kazumi Osato, Satoshi Ujo,   Prediction of formation equilibrium temperature while drilling based on
                Stephen White   drilling mud temperature: Inverse problem using TOUGH2 and wellbore
                                            thermal model

11:00 − 11:20   Micol Todesco, Jonny Rutqvist,   Modeling of recent volcanic episodes at Phlegrean Fields (Italy): Geochemical
                Giovanni Chiodini, Karsten Pruess, variations and ground deformation
                Curt Oldenburg

11:20 − 11:40   Pat Dobson, Sonia Salah,   Simulation of water-rock interaction in the Yellowstone geothermal system
                Nicolas Spycher,   using TOUGHREACT
                Eric Sonnenthal

11:40 − 13:00   *Lunch Break, LBNL Cafeteria*

Monday Afternoon, May 12, 2003, Building 66 Auditorium

Session 2: Fracture Flow and Vadose Zone Hydrology

Chairman: Paul Witherspoon, University of California, Berkeley, California

13:00 – 13:30 *Stefan Finsterle*   *iTOUGH2: From parameter estimation to model structure identification*

13:30 – 13:50 Robert Podgorney, Jerry Fairley   Evaluating conceptual models of flow in unsaturated, fractured porous media

13:50 – 14:10 Hui-Hai Liu, Guoxiang Zhang,   The Active Fracture Model: Its relation to fractal flow patterns and further
                         Gudmundur Bodvarsson   evaluation using field observations

14:10 – 14:30 Ivan Lunati, Wolfgang Kinzelbach   Gas tracer tests in an unsaturated fracture: Water soluble gases as partitioning
                                                                                 tracers

14:30 – 15:00   *Coffee Break*

15:00 – 15:20 Niclas Bockgård, Auli Niemi   Role of soil-rock interaction on recharge into fractured rock

15:20 – 15:40 Alan Flint   The role of unsaturated flow in artificial recharge projects

15:40 – 16:00 Michael Kowalsky, Stefan Finsterle, Estimating flow parameters using ground-penetrating radar and hydrological
                         Yoram Rubin   data during transient flow in the vadose zone

Monday Evening, May 12, 2003, Cafeteria

Session 3:   Poster Session

Chairman: Curt Oldenburg, Lawrence Berkeley National Laboratory, Berkeley, California

17:00 − 20:00   *Poster Session*

Session 3.1:   New Modules and Developments

Jong Kim, Stefan Finsterle	Application of automatic differentiation in TOUGH2
Karsten Pruess, Alfredo Battistelli	TMVOC, a simulator for multiple volatile organic chemicals
Chao Shan, Karsten Pruess	EOSN—A new TOUGH2 module for simulating transport of noble gases in the subsurface

Session 3.2:   Pre- and Post-Processing

Daniel Swenson, Brian Hardeman, Casey Presson, Charlie Thornton	Using PetraSim to create, execute, and post-process TOUGH2 models
Kazumasa Ito, Yongkoo Seol	A 3-dimensional discrete fracture network generator to examine fracture-matrix interaction using TOUGH2
Lehua Pan	WinGridder—An interactive grid generator for TOUGH2
John Burnell, Stephen White, Kazumi Osato, Tatsuya Sato	GeoCad—A pre- and postprocessor for TOUGH2
Tatsuya Sato, Kazumi Ohsato, Takahiro Shiga	G-Star-Base (G*Base)—A data base system for underground information and post-processing for TOUGH2

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Session 3.3:   Geothermal Engineering

Jason McKenna, David Blackwell	Numerical modeling of transient basin and range extensional geothermal systems
Tatsuya Sato, Kazumi Ohsato, Takahiro Shiga, Masatake Sato, Stephen White, Warwick Kissling	A study of reservoir estimation for a deep-seated geothermal reservoir using TOUGH2 and CHEMTOUGH2
Alexey Kiryukhin, V. Yampolski	Modeling study of the Pauzhetsky geothermal field, Kamchatka, Russia
Yvette Ontoy, Phil Molling, Nicolas Spycher, Tianfu Xu, Mauro Parini, Karsten Pruess	Scaling of hot brine injection wells: Supplementing field studies with reactive transport modeling

Session 3.4:   Gas Transport and Vadose Zone Hydrology

Alfredo Battistelli, Curt Oldenburg, George Moridis, Karsten Pruess	Modeling gas reservoir processes with TMVOC V.2.0
Julio García, Karsten Pruess	Flow instabilities during injection of CO_2 into saline aquifers
Curt Oldenburg, André Unger	Coupled subsurface-surface layer gas transport and dispersion for geologic carbon sequestration seepage simulation
Wenbin Wang, Shlomo Neuman, Tzung-mow Yao, Peter Wierenga	Comparative simulations of a large-scale field infiltration experiment

Session 3.5:   Nuclear Waste Isolation

Rick Ahlers, Teamrat Ghezzehei, Stefan Finsterle	Development and testing of a method for efficient simulation of evaporation from a seepage face
Irina Engelhardt	Inverse modeling of gas, water, and heat flow in bentonite/crushed rock backfill
Teamrat Ghezzehei, Stefan Finsterle, Robert Trautz	Evaluating the effectiveness of liquid diversion around an underground opening when evaporation is non-negligible
George Moridis, Yongkoo Seol, Yu-Shu Wu	Modeling studies of mountain-scale radionuclide transport in the unsaturated zone at Yucca Mountain, Nevada
André Unger, Stefan Finsterle, Gudmundur Bodvarsson	Estimating large-scale fractured rock properties from radon data collected in a ventilated tunnel

Session 3.6:   Environmental Engineering

Alex Lee	3-D numerical modeling of freshwater lens on atoll islands
Quanlin Zhou, Jens Birkholzer, Iraj Javandel, Preston Jordan	Simulation of groundwater flow at the LBNL using TOUGH2
Jeongkon Kim, Franklin Schwartz, Jianyou Shi, Tianfu Xu	Modeling the coupling between flow and transport developed by chemical reactions and density differences using TOUGHREACT

Tuesday Morning, May 13, 2003, Building 66 Auditorium

Session 4: Nuclear Waste

Chairman: Alan Flint, U.S. Geological Survey, Sacramento, California

09:00 − 09:30 *Gudmundur Bodvarsson,* Jens Birkholzer, Stefan Finsterle, Hui-Hai Liu, Jonny Rutqvist, Yu-Shu Wu   *The use of TOUGH2/iTOUGH2 in support of the Yucca Mountain Project: Successes and limitation*s

09:30 − 09:50 Rainer Senger, Bill Lanyon, Paul Marschall, Stratis Vomvoris, Kenichi Ando   TOUGH2/iTOUGH2 modeling in support of the gas migration test (GMT) at the Grimsel Test Site (Switzerland)

09:50 − 10:10 Keni Zhang, Yu-Shu Wu, Chris Ding, Karsten Pruess   TOUGH2_MP: A parallel version of TOUGH2

10:10 − 10:30 Joachim Poppei, Gerhard Mayer, Jean Croisé   Modelling of resaturation, gas migration and thermal effects in a SF/ILW repository in low-permeability over-consolidated clay-shale

10:30 − 11:00   *Coffee Break*

11:00 − 11:20 Vijen Javeri   Analysis of nuclide transport including non-linear adsorption depending on variable salinity in the heterogeneous geosphere of the Gorleben channel

11:20 − 11:40 Yu-Shu Wu, Guoping Lu Keni Zhang, Bo Bodvarsson   A mountain-scale model for characterizing unsaturated flow and transport in fractured tuffs of Yucca Mountain

11:40 − 12:00 Jens Birkholzer, Sumit Mukhophadhyay, Yvonne Tsang   Modeling water seepage into heated waste emplacement drifts at Yucca Mountain

12:00 − 13:30   *Lunch Break, LBNL Cafeteria*

Tuesday Afternoon, May 13, 2003, Building 66 Auditorium

Session 5:   Mining Engineering

Chairman: Kazumi Osato, Geothermal Energy Research and Development Company (GERD), Tokyo, Japan

13:30 − 14:00   *Stephen White*, Ashley Creighton,   *Modelling the dewatering and depressurisation of the Lihir open pit gold mine*
                Paul Bixley, Warwick Kissling

14:00 − 14:20   Yannick Scheid, Stephan Semprich,   Computation of laboratory test results to estimate the loss of air in compressed
                A. Chinkulkijniwat   air tunnelling

14:20 − 14:40   Jonny Rutqvist, Chin-Fu Tsang   TOUGH-FLAC: a numerical simulator for analysis of coupled thermal-hydrologic-mechanical processes in fractured rock under multi-phase flow condition

14:40 − 15:00   *Coffee Break*

Session 6:   Reactive Transport

Chairman: Jens Birkholzer, Lawrence Berkeley National Laboratory, Berkeley, California

15:00 − 15:30   *Alfredo Battistelli*   *Modeling the biodegradation of organic contaminants with TMVOCbio*

15:30 − 15:50   Tianfu Xu, Eric Sonnenthal,   TOUGHREACT: A new code of the TOUGH family of non-isothermal
                Nicolas Spycher, Karsten Pruess   multiphase reactive geochemical transport in variably saturated geologic media

15:50 − 16:10   Michael Singleton, Eric Sonnenthal,   Numerical modeling of stable isotope fractionation and multiphase reactive
                Mark Conrad, Don DePaolo   transport of water vapor using TOUGHREACT

16:10 − 16:30   Stephan Lorenz, Wolfgang Müller   Modelling of halite formation in natural gas storage aquifers

16:30 − 16:50   Eric Sonnenthal, Nicolas Spycher,   Linking reaction, transport, and hydrological parameters in unsaturated
                Tianfu Xu   fractured rock: TOUGHREACT implementation and application

17:30 − 21:00   *Conference Dinner, LBNL Cafeteria*

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Wednesday Morning, May 14, 2003, Building 50 Auditorium

Session 7: Environmental Remediation

Chairman: Auli Niemi, Uppsala University, Sweden

08:30 − 09:00 *Ron Falta*   *Simulation of subgridblock scale DNAPL pool dissolution using a dual domain approach*

09:00 − 09:20 Terhi Kling, Juhani Korkealaakso   Nonisothermal multiphase modeling as an integration tool in the planning, control and optimization of in situ soil remediation in Söderkulla, southern Finland

09:20 − 09:40 Fritjov Fagerlund, Auli Niemi   Multi-constituent modelling of a gasoline spill using the T2VOC numerical simulator

09:40 − 10:00 Steve Webb, James Phelan   Implementation of land surface boundary conditions in TOUGH2

10:00 − 10:30   *Coffee Break*

Session 8: Gas Transport

Chairman: Vijen Javeri, Gesellschaft für Anlagen- und Reaktorsicherheit (GRS), Köln, Germany

10:30 − 11:00 *Karsten Pruess*   *Numerical simulation of leakage from a geologic disposal reservoir for CO_2, with transitions between super- and sub-critical conditions*

11:00 − 11:20 Christine Doughty, Karsten Pruess   Modeling supercritical CO_2 injection in heterogeneous porous media

11:20 − 11:40 Curt Oldenburg   Carbon sequestration in natural gas reservoirs: Enhanced gas recovery and natural gas storage

11:40 − 12:00 George Moridis, Timothy Collett   Strategies for gas production from hydrate accumulations under various geological and reservoir conditions

12:00 − 13:00   *Lunch Break, LBNL Cafeteria*

Wednesday Afternoon, May 14, 2003, Building 50 Auditorium

Session 9:   Tricks-of-the-Trade

Chairman: Stephen P. White, Industrial Research Ltd., Lower Hutt, New Zealand

13:00 − 13:30	Karl Taylor	Evaluation and intercomparison of climate models
13:30 − 14:45	Participants	Two-slide, three-minute presentations: TOUGH problem—SMART solution
		Please inform the Organizing Committee about your contribution to this session or submit short description of TOUGH problem.
14:45 − 15:00		*Coffee Break*

Session 10: Panel Discussion

Chairman: Karsten Pruess, Lawrence Berkeley National Laboratory, Berkeley, California

15:00 − 16:00	Ron Falta Alan Flint George Moridis Steve Webb Steve White	Panel discussion